PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2001-141376

(43)Date of publication of application : 25.05.2001

(51)Int.Cl. F27D 21/00
C22B 15/00
C22B 15/06
C22B 15/14
F27D 3/18
G01B 11/02
G01B 11/24
// C21C 5/46
C22B 9/05

(21)Application number : 11-321802

(22)Date of filing : 11.11.1999

(71)Applicant : MITSUBISHI MATERIALS CORP

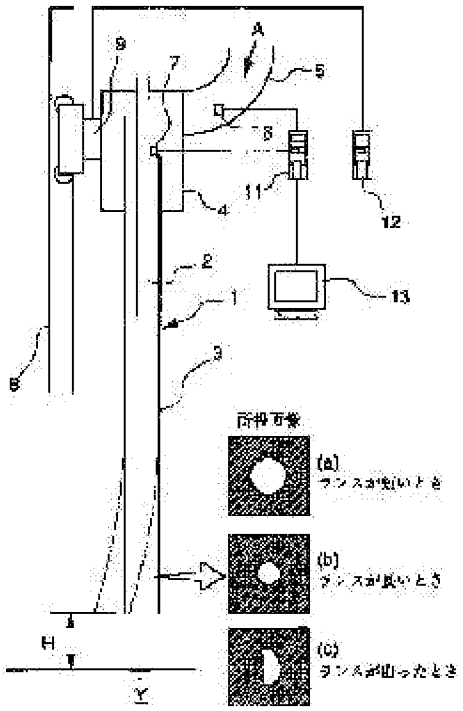
(72)Inventor : HASEGAWA NOZOMI
TANAKA FUMITO

(54) METHOD AND DEVICE FOR CONTROLLING LANCE OF REFINING FURNACE

(57)Abstract:

PROBLEM TO BE SOLVED: To grasp the blocking and bending of the tip of a lance by eliminating the error in the lance length.

SOLUTION: In the method for controlling the lance of a refining furnace, a lance 1 consisting of inner and outer pipes 2 and 3 is arranged in a furnace, lance air A is supplied from a pipeline 5 that is connected to the upper end side of the outer pipe 3 of the lance 1 into the outer pipe 3, and at the same time a raw material is supplied from the inner pipe 2 to the lance pipe of the refining furnace. In the method, the flow rate of the lance air in the pipeline 5 is made constant, pressure in the pipeline 5 is measured by a pressure- measuring instrument 6, the length of the lance 1 is obtained based on the measurement result, at the same time a CCD camera 7 for picking up the image of the lower end opening of the lance 1 through the inside of the lance is provided at the upper end of the lance 1, the length of the lance 1 is obtained from an image being picked up by the CCD camera 7, and the lance length obtained by measuring the pressure is compared with the



lance length obtained from the image being picked up by the CCD camera 7, thus grasping the lance length and the lance state.

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CLAIMS

[Claim(s)]
[Claim 1]In a lance pipe Osamu method of a refining furnace which supplies a raw material from said inner tube supplying a lance air in this outer tube from a pipeline which a lance which consists of an inner tube and an outer tube was allocated in a furnace, and was connected to the upper bed side of an outer tube of this lance, After fixing the rate of flow of said lance air in said pipeline, measure a pressure in this pipeline with a pressure survey machine, find the length of said lance based on the measurement result, and. The length of a lance which formed a camera which photos a lower end opening part of a lance through an inside of Reims to an upper bed of said lance, and found the length of a lance from a picture which the camera photoed and for which it asked by measurement of said pressure, A lance pipe Osamu method of a refining furnace grasping a state of a lance as the length of a lance by comparing the length of a lance for which it asked from a picture which a camera photoed.
[Claim 2]When the length of a lance for which it asked by measurement of said pressure, and the length of a lance for which it asked from a picture which a camera photoed are in agreement, A lance pipe Osamu method of a refining furnace, wherein the length of a lance for which it asked by measurement of a pressure considers that it is proper measured value and controls height of a lance from a molten metal surface in a furnace to an optimum value based on the result.
[Claim 3]A lance pipe Osamu device of a refining furnace which supplies a raw material from said inner tube supplying a lance air in this outer tube from a pipeline characterized by comprising the following which a lance which consists of an inner tube and an outer tube was allocated in a furnace, and was connected to the upper bed side of an outer tube of this lance.
A pressure survey machine which measures a pressure of said lance air.
Based on a camera which is formed in an upper bed of said lance and photos a lower end opening part of a lance through an inside of Reims, and an output of said pressure survey

machine, find the length of a lance, and. A means to distinguish the length of a lance, and a state of a lance by finding the length of a lance from a picture which said camera photoed, and comparing both value.

[Claim 4]A lance pipe Osamu device of the refining furnace [provided with a means to tell outside about a lance impaction efficiency mechanism in which a vertical position of said lance is adjusted based on a discriminated result of a means to distinguish the length of said lance, and a state of a lance, and a discriminated result] according to claim 3.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the lance pipe Osamu method and lance pipe Osamu device for supplying an ore and oxygen to a refining furnace.
[0002]
[Description of the Prior Art]If it is in refining furnaces in a copper-refining process, such as a smelting furnace and a copper metallurgy furnace, the lance which blows raw materials, such as an ore, with oxygen for promoting blowing is provided to the molten metal in a furnace.
[0003]In such a refining furnace, in order to stabilize mixing with above ores and oxygen, and the molten metal in a furnace, it is made important to always keep constant the distance from the lower end of a lance to the surface of hot water of a molten metal.
[0004]However, since the phenomenon (erosion) in which the lance fuses and decreases from the lower end arises if it is under the elevated temperature in a furnace, in order to keep constant the distance from a lance lower end to the molten metal surface of hot water, the work of checking the inside of a furnace frequently, and adjusting and managing the height of a lance was indispensable.
[0005]Then, by carrying out learning of the length of the lance in a furnace by a certain means, the distance from a lance lower end to the molten metal surface of hot water has been grasped, and the controlling method of the lance of adjusting the position of a lance based on this result has been adopted conventionally.
[0006]The art of the statement is known by JP,10-170166,A as one of methods. After fixing the rate of flow of the air passed to a lance, he measures the pressure in a lance and is trying for the one where lance length is larger to convert the length of a lance with measuring pressure power from the relation that the back pressure in a pressure survey point becomes large, in this method.

[0007]
[Problem(s) to be Solved by the Invention]However, although the length of the lance was found only by measurement of the pressure with the above-mentioned art, detection which was wrong only by it might be performed. That is, although the lance was exhausted and length was short when the tip of a lance was blockaded by the affix, it might judge with lance length being long because back pressure (measuring pressure power) becomes large according to increase of pressure loss. Even if there was no problem in measurement of the length itself, it has not grasped to a bend of a lance. That is, it is because it will judge that there is almost no change of a pressure and there are also no abnormalities when a bend arises at the tip of a lance. Since it was one of the factors which operates unstably by such a blockade and a bend of the tip of a lance reducing reaction efficiency like the height of a lance, the stabilization effect of operation by the conventional lance pipe Osamu method was not necessarily enough.

[0008]In consideration of the above-mentioned situation, this invention loses the erroneous detection of lance length, and an object of this invention is to provide the reliable lance pipe Osamu method and controlling device which can also grasp a blockade and a bend of the tip of a lance.
[0009]
[Means for Solving the Problem]In a lance pipe Osamu method of a refining furnace an invention of claim 1 supplies a raw material from said inner tube supplying a lance air in an outer tube from a pipeline which a lance which consists of an inner tube and an outer tube was allocated in a furnace, and was connected to the upper bed side of an outer tube of this lance, After fixing the rate of flow of said lance air in said pipeline, measure a pressure in this pipeline with a pressure survey machine, find the length of said lance based on the measurement result, and. The length of a lance which formed a camera which photos a lower end opening part of a lance through an inside of Reims to an upper bed of said lance, and found the length of a lance from a picture which the camera photoed and for which it asked by measurement of said pressure, By comparing the length of a lance for which it asked from a picture which a camera photoed, a state of a lance is grasped as the length of a lance.
[0010]In this invention, after keeping the rate of flow of a lance air constant, the length of a lance is found by measuring a pressure in a pipeline (this point is the same as conventional technology mentioned above). That is, since change of pressure loss by change of the length of a lance appears as change of a pressure in the point of measurement, if its attention is paid to change of a pressure, the amount of erosions of a lance can be detected and, thereby, the length of a lance can be found.
[0011]The length of a lance is found by a picture which, on the other hand, photoed a lower end opening part of a lance with a camera arranged on an upper bed of a lance. That is, since

distance from a camera to an opening becomes small as an effective area product is small photoed by that distance from a camera to an opening is large, a tip carries out an erosion and a lance becomes short when the length of a lance is long, an effective area product is photoed greatly. Therefore, the length of a lance can be found in analyzing a size of an effective area product of a lance lower end in a photoed picture for example, with the image-processing technique.

[0012]And the length of a lance for which it asked by measurement of a pressure confirms whether to be a proper value by comparing the length of a lance for which it asked by measurement of a pressure with the length of a lance for which it asked based on a picture photoed with a camera. When it is not a proper value, it can be grasped that there are a certain abnormalities.

[0013]That is, since progress condition of an erosion of a lance can be presumed about, aim that a degree of change of a pressure and a degree of change of an effective area product according to change of the length of a lance are also near is attached. When a tip of a lance is blockaded by an affix to it, change of an actually measured pressure becomes large rapidly rather than a range expected, or change of an actually photoed effective area product becomes small rapidly rather than a range expected. In order for the length of a lance for which each was asked from a measurement result of a pressure, and the length of a lance for which it asked from a picture of a camera to vary greatly, it stops and being mutually in agreement. Then, when such a phenomenon is caught, it can be judged that a tip of a lance blockaded. Although the length of a lance for which it asked from a measurement result of a pressure seldom changes, when the length of a lance for which it asked from a picture of a camera changes a lot, it can be considered that a tip of a lance changed.

[0014]The length of a lance which asked for an invention of claim 2 by measurement of said pressure, When the length of a lance for which it asked from a picture which a camera photoed is in agreement, the length of a lance for which it asked by measurement of a pressure considers that it is proper measured value, and controls height of a lance from a molten metal surface in a furnace to an optimum value based on the result.

[0015]In this invention, since height of a lance is adjusted to an optimum value according to it when measurement of the length of a lance is performed properly, stable operation is attained.

[0016]A lance which consists of an inner tube and an outer tube is allocated in a furnace, and an invention of claim 3 equips with the following a lance pipe Osamu device of a refining furnace which supplies a raw material from said inner tube, supplying a lance air in an outer tube from a pipeline connected to the upper bed side of an outer tube of this lance.

A pressure survey machine which measures a pressure of said lance air.

A camera which is formed in an upper bed of said lance and photos a lower end opening part of a lance through an inside of Reims.

A means to distinguish the length of a lance, and a state of a lance by finding the length of a lance based on an output of said pressure survey machine, and finding the length of a lance from a picture which said camera photoed, and comparing both value.

[0017]In this invention, a method of an invention of claim 1 can be easily enforced by arranging a pressure survey machine and a camera in the upper part of a lance.
[0018]An invention of claim 4 is provided with a means to tell outside about a lance impaction efficiency mechanism in which a vertical position of said lance is adjusted based on a discriminated result of a means to distinguish the length of said lance, and a state of a lance, and a discriminated result.
[0019]In this invention, since height of a lance can be adjusted to an optimum value according to it when measurement of the length of a lance is performed properly, stable operation is attained. When an unusual state is detected, by taking out an alarm to a monitor etc., a worker can be told and early measures can be taken.
[0020]
[Embodiment of the Invention]Hereafter, the embodiment of this invention is described based on a drawing. In drawing 1, the numerals 1 show a lance. The lance 1 consists of the inner tube 2 and the outer tube 3, as for the inner tube 2, an ore and air are supplied in a furnace and the outer tube 3 supplies oxygen and air in a furnace. Under the lance 1, the molten metal Y is stagnating, and the lance 1 is arranged in a furnace so that the distance to the surface of hot water of the molten metal 5 may be set to H from the lower end. The pipeline 5 for [of the furnace crown above the lance 1 and a furnace top floor] the lance header 4 being further formed in the upper part (outside of a furnace), and supplying the air (lance air) A to the lance header 4 from the exterior of a furnace to the lance 1 is connected.
[0021]In the pipeline 5, the pressure survey machine 6 which measures the pressure of the air A supplied to the lance 1 through this pipeline 5 is formed, and the signal of the pressure survey machine 6 is inputted into the computing unit 11. CCD camera (camera) 7 which photos the lower end opening part of the outer tube 3 through the inside of the outer tube 3 is formed in the upper bed of the outer tube 3 of the lance 1, and the signal of this CCD camera 7 is also inputted into the computing unit (discriminating means) 11.
[0022]The computing unit 11 is electrically connected with the controller 12 and the monitor 13. The controller 12 sends a control signal to the lance impaction efficiency mechanism 9 which moves the lance 1 up and down along with the guide rail 8.
[0023]The computing unit 11 finds the length of the outer tube 3 of the lance 1 based on the output signal of the pressure survey machine 6, and it finds the length of the outer tube 3 of the lance 1 from the picture which CCD camera 7 photoed. Since it is the same as the former, the method of finding the length of the lance 1 from the measured value of a pressure is not

described especially here. The method of converting change of an effective area product into the length of a lance from the picture which CCD camera 7 photoed, using the image-processing technique as a method of finding the length of the lance 1 is used. For example, when the lance 1 is long, as shown in (b), an effective area product is small, but as the lance 1 becomes short, and shown in (a), an effective area product becomes large. The length of the lance 1 is deduced using change of such an effective area product.

[0024]And when the computing unit 11 compares the length of the lance 1 for which it asked by measurement of the pressure with the length of the lance 1 for which it asked from the picture of CCD camera 7, It confirms whether the length of the measured lance 1 is an appropriate value, and when it is not an appropriate value, a judgment that abnormalities have occurred in the lance 1 is made. For example, if both value is in agreement, it will consider that the lance 1 does not blockade and the measured lance length will be transmitted to the controller 12.

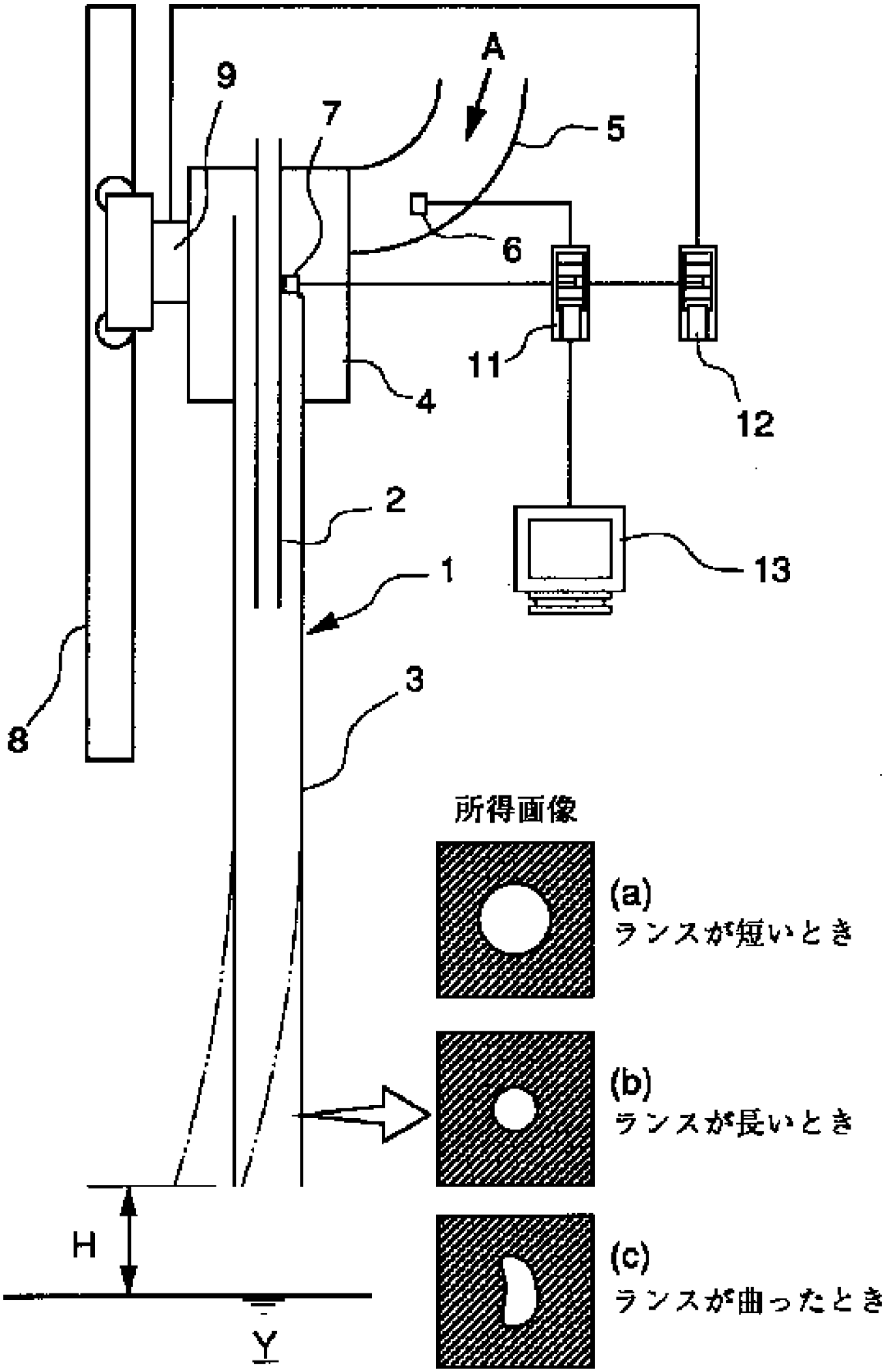
[0025]If it does so, the controller 12 will compute lance height H from the position of lance length and the lance header 4, will send a signal to the lance positioning mechanism 9, will make it run the lance header 4 up and down, and it will be controlled so that the height of the lower end of the lance 1 becomes the optimal.

[0026]On the other hand, when the lance length found from the output signal of the pressure survey machine 6 and CCD camera 7 is not in agreement, it considers that the lance 1 blockades and warning is displayed on the monitor 13. The monitor 13 has always projected the image photoed with CCD camera 7 so that the situation at the tip of the lance 1 can be observed. Therefore, naturally it can also perform getting to know the existence of a blockade by seeing a picture. The computing unit 11 records aging of the output signal of the pressure survey machine 6 and CCD camera 7. And although the output signal of the pressure survey machine 6 seldom changes, when the output signal of CCD camera 7 shows that the effective area product of the lance tip decreased rapidly, the tip of the lance 1 considers that it changed like a two-dot chain line, and takes out warning to the monitor 13. The picture in this case becomes as shown in (c), and can also be checked on the screen of the monitor 13.

[0027]

[Effect of the Invention]As explained above, since this invention measures lance length and controls lance height after it distinguishes the existence of a blockade of a lance tip, and the existence of a bend, it can stabilize operation and can raise an operating ratio. Since it is possible to detect a blockade and a bend of a tip promptly and certainly, the stabilization effect of operation is large.

[Translation done.]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